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Data-Driven Analysis of Omnichannel Purchasing Pathways: Age and Gender Effects Across Retail Product Categories

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Abstract
The emergence of omnichannel environments has transformed consumer purchasing into a highly complex, multistage decision-making process, generating nonlinear demand signals that heavily influence retail logistics, inventory optimization, and production engineering systems. Moving beyond the binary choice between online and offline commerce, omnichannel purchasing reflects structured pathways through which consumers allocate information search and transaction activities across multiple touchpoints. This paper investigates how age and gender influence these purchasing pathways across selected product categories using a data-driven analytical framework. The empirical analysis is based on primary survey data collected from 889 consumers with prior omnichannel purchasing experience. To identify systematic differences and predictive patterns in purchasing behavior, categorical data analysis methods are employed, including chi-square tests of independence, association measures, and multinomial logistic regression (MLR). The results indicate that omnichannel purchasing behavior varies significantly across age groups, with younger consumers displaying stronger tendencies toward digitally completed transactions, even when physical stores are involved in the earlier stages of the purchasing process. Older consumers exhibit greater reliance on in-store purchasing in selected product categories, suggesting differences in channel substitution and complementarity. Gender-based variations further shape purchasing pathways, particularly in webrooming and showrooming behaviors, highlighting the importance of demographic segmentation in channel integration strategies. Additional heterogeneity was observed in channel interaction patterns across demographic segments, further reinforcing the structured nature of omnichannel purchasing pathways. These findings provide insights into demand allocation across channels and offer implications for the design and evaluation of omnichannel retail systems within contemporary digital economies.

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1. Introduction

In the context of contemporary industrial operations, the seamless integration of digital and physical retail channels has fundamentally disrupted traditional supply chain management and production engineering systems (Aflaki et al., 2020; Madlenak et al., 2023; Strenitzerová et al., 2018). The emergence of omnichannel environments has transformed consumer purchasing into a highly complex multistage decision-making process. This behavioral shift has profound implications for retail logistics, inventory optimization, and demand forecasting frameworks. From a production engineering and operations management perspective, omnichannel retailing represents a massive, decentralized demand-allocation problem. Consumers dynamically distribute their information search and transaction activities across multiple interconnected touchpoints, thereby generating nonlinear demand signals that heavily influence reverse logistics, warehousing capacity requirements, and last-mile delivery operations.

Although extensive research in industrial engineering has evaluated the optimization of production processes and static logistics networks, achieving continuous operational improvement requires a robust, data-driven understanding of the demand-side drivers that initiate these supply chains (Madlenak

et al., 2020). Omnichannel consumer pathways characterized by behaviors such as webrooming, showrooming, and dynamic cross-channel movement are critical. They dictate how physical inventory must be allocated across regional distribution centers versus brick-and-mortar storefronts to prevent costly stockouts and minimize the holding costs. Therefore, investigating how demographic heterogeneity, specifically age and gender cohorts, influences these purchasing pathways is essential for the systemic design, capacity planning, and operational resilience of modern retail engineering systems.

Previous research has highlighted both the opportunities and challenges associated with omnichannel strategies. Studies such as Hole et al. (2019) identified key factors shaping omnichannel behavior and emphasized the complexity of integrating multiple channels within retail systems. Similarly, Maggioni et al. (2020) provide insights into cross-channel purchasing behavior, demonstrating that discrepancies may arise between retailer strategies, consumer expectations and purchasing plans. Other studies question whether omnichannel strategies are universally beneficial, pointing to potential inefficiencies and coordination challenges across channels (Chen et al., 2023; Liu et al., 2020a; Zhao et al., 2020). These findings suggest that omnichannel behavior should be examined not only as a marketing phenomenon but also as an economically structured decision-making process.

This study was motivated by the need to better understand how consumers navigate omnichannel retail environments, as digital touchpoints create nonlinear demand signals. This study addresses this gap by conceptualizing omnichannel purchasing as a structured multistage decision-making pathway rather than an isolated channel choice. While omnichannel retailing has been widely examined, limited attention has been paid to how consumers systematically integrate browsing and transaction activities across online and physical channels in discrete demographic segments.

To date, no study has simultaneously quantified the effect of both age and gender on discrete omnichannel purchasing pathways across multiple product categories within a single unified analytical framework, leaving a critical empirical gap at the intersection of consumer demographics and retail engineering demand allocation.

Accordingly, this study adopts a data-driven approach to analyzing omnichannel purchasing as an economic decision-making process. By examining age- and gender-based differences across multiple product categories, this study provides empirical evidence relevant to retail logistics and digital commerce, enhancing the understanding of how consumer demand is allocated across decentralized retail systems.

From the perspective of retail economics, omnichannel purchasing can be conceptualized as an allocation problem, wherein consumers distribute their information searches and transaction activities across competing and complementary distribution channels. Instead of selecting a single channel, consumers encounter trade-offs related to transaction costs, information asymmetry, perceived risk, and convenience. These trade-offs differ across product categories and demographic groups, resulting in diverse purchasing pathways in omnichannel retail systems. Economic research indicates that channel choice is influenced not only by price considerations but also by non-monetary costs, such as search effort, time investment, and uncertainty associated with product evaluation. Physical retail environments reduce uncertainty for experience and credence goods by allowing direct inspection, whereas digital channels often offer lower transaction costs and greater price transparency. Omnichannel behavior reflects rational decision-making under heterogeneous constraints, rather than inconsistent consumer behavior.

Recent studies have emphasized the importance of channel complementarity, highlighting that online and offline channels frequently serve different functional roles in the purchasing process (Gao and Fan, 2021). Online channels tend to dominate information searches and price comparisons, whereas physical stores provide experiential validation and risk reduction. This complementarity challenges traditional substitution-based views of retail channel competition and supports a more integrated understanding of omnichannel retailing.

Despite these insights, empirical evidence on how consumers allocate purchasing activities across channels in a structured manner remains limited, particularly when accounting for demographic heterogeneity and product-specific characteristics. Many existing studies have focused on isolated channel preferences or single-stage decisions, leaving a critical research gap in understanding how browsing and purchasing decisions are combined into coherent purchasing pathways in omnichannel environments.

2. Literature review

The distinction between consumers and customers in online shopping is a focal point in contemporary literature. Research by Shih et al. (2019) and Țoniș-Bucea-Manea et al. (2019) explored customer perception and behavior, finding that while online shopping is often perceived as a superior option, security concerns remain a significant barrier. Additionally, Țoniș-Bucea-Manea et al. (2019) emphasized the diverse factors influencing consumer behavior within the Internet of Things (IoT) ecosystem. Joshi et al. (2021) evaluate the impact of demographics on customer attitudes, while Zhao et al. (2022) provide a theoretical framework for understanding behavioral patterns in virtual storefronts. Singh and Srivastava (2019) further demonstrate that consumer engagement in multichannel online retail environments is shaped by both individual characteristics and channel-specific attributes, with demographic factors playing a measurable role in determining the depth and consistency of cross-channel interactions. Collectively, these studies demonstrate the multidimensional nature of consumer behavior in digital settings. However, to effectively support online business operations, research must move beyond these descriptive insights to address the specific barriers, such as webrooming and showrooming, that hinder wider omnichannel adoption, particularly among younger demographic segments.

While contemporary retail research increasingly recognizes multi-rooming, characterized by a fluid, non-linear oscillation between multiple digital and physical touchpoints (Moliner &

Tortosa-Edo, 2024) as the global hallmark of omnichannel environments, the operational optimization of retail engineering systems requires a more granular decomposition of these journeys. It is insufficient to view omnichannel integration only as a global, outward phenomenon; rather, the substance of the research must lie in identifying the specific internal structural pathways that consumers navigate.

For the purposes of this study, 'omnichannel purchasing pathways' are conceptualized as discrete, sequentially structured behavioral patterns through which consumers allocate information search and transaction activities across digital and physical retail touchpoints within a single purchase episode. This definition explicitly distinguishes these pathways from (a) multichannel behavior, which involves parallel but uncoordinated channel use, and (b) the broader multi-rooming phenomenon (Moliner & Tortosa-Edo, 2024), which describes fluid, nonlinear oscillation across all available touchpoints. Our operationalization focuses specifically on measurable two-stage sequences webrooming (Online→BM) and showrooming (BM→Online) as well as consistent single-channel paths (Online/Online; BM/BM), enabling precise empirical quantification of demand allocation patterns. As visually synthesized in our framework, Omnichannel Purchasing Pathways' (Figure 1), this approach allows for a precise mapping of how consumers move through space and time to execute a transaction. While a general omnichannel view assumes a seamless 'everything-with-everything' interaction, production and fulfillment networks require the identification of specific trajectories to effectively manage inventory allocation and demand forecasting. By focusing on these isolated pathways, this study provides the necessary architectural insight into the discrete behavioral sequences that initiate supply chain operations, effectively bridging the gap between global consumer trends (Moliner & Tortosa-Edo, 2024) and the systemic requirements of modern retail engineering ecosystems.

Recent theoretical advancements emphasize that modern retail must accommodate highly complex, cross-channel free-riding behaviors, prominently characterized as ' multi-rooming ' (Moliner & Tortosa-Edo, 2024). Furthermore, the underlying drivers of these behaviors are heavily mediated by internal reasoning patterns related to consumer value (Zafar et al., 2023).

Despite these conceptual developments, a critical research gap remains: the literature lacks a granular, empirical synthesis of how discrete demographic variables (age and gender) systematically dictate nonlinear purchasing pathways across distinct product categories. This study provides a theoretical contribution by moving beyond descriptive frameworks and explicitly quantifying how demographic heterogeneity drives decentralized demand allocation, which is a critical input required for optimizing modern retail supply chains and production engineering networks.

2.1. Omnichannel Adoption Across Generations

Engaging with multiple channels for a single purchase and transitioning between touchpoints throughout the shopping process exemplifies omnichannel behavior. For practitioners and researchers, it is of considerable interest to investigate the factors contributing to consumers' channel switching during their purchasing journey, as this understanding facilitates the formulation of more effective cross-channel marketing strategies. Furthermore, statistically significant differences in channel interactions have been identified across gender cohorts (Matos et al., 2022).

Despite the potential advantages of omnichannel retailing, barriers to adoption persist as significant concerns, particularly among younger consumers. Joshi et al. (2021) explored the challenges hindering young consumers' engagement in omnichannel retailing, offering valuable insights for retailers aiming to target this demographic effectively while Rukmana et al. (2019) identified key determinants of omnichannel service adoption, finding that perceived usefulness and trust remain critical factors influencing consumers' willingness to engage across multiple channels, with notable variation across demographic groups. Building on this foundation, the present study focuses on the behavioral patterns of Generation Y and Generation Z (Table 1), as these cohorts represent the primary drivers of digital-physical channel integration in retail.

The study by Beregovskaya et al. (2020) highlights both the opportunities and challenges of implementing omnichannel marketing for Generation Z. While these consumers value the ability to independently choose interaction modes and switch channels seamlessly, significant barriers remain, including the lack of standalone online sales channels, slow-loading platforms with cumbersome interfaces, and limited mobile app functionality

Table 1. Generations Z and Y Definitions (Source: Joshi et al., 2021)

Age Group (Birth Year)	Generation	Age Group in Research	Key Characteristics
Born 1997 - 2012	Generation Z (Centennials, Zoomers)	18-23	Self-sufficient, multitasking, open to digital advancements, and valuing authentic communication.
Born 1981 - 1996	Generation Y (Millennials)	24 - 42	They are collaborative, achievement-oriented, creative, and highly adaptive to new technologies.

**Note: Note: The age ranges presented in the 'Age Group in Research' column represent the operational sample brackets used in this study (data collection 2024-2025) and are defined to capture the digitally active sub-cohorts of Generations Y and Z most relevant to omnichannel retail behavior, rather than the full generational birth-year ranges.*

2.2. The role of webrooming and showrooming in omnichannel integration

The omnichannel concept involves a cohesive and integrated experience encompassing various touchpoints, including brick-and-mortar stores, online shops, and direct marketing efforts. This ecosystem extends to mass communication platforms (television, radio, print) and digital channels such as

social media, search engines, comparison websites, and branded mobile applications (Öztürk & Okumuş, 2018). While retailers recognize the necessity of adopting omnichannel strategies, empirical data on the extent and effectiveness of this transformation remain limited, complicating the identification of key operational enhancements (Acquila-Natale and Iglesias-Pradas 2021; Iglesias-Pradas et al. 2022).

Establishing a showroom channel requires the strategic alignment of online and offline operations. Delivering a seamless service experience incurs specific effort costs that must be balanced against the benefits of reducing consumer uncertainty. Research indicates that the optimal decision-making process for a retailer differs significantly before and after opening a showroom channel, particularly regarding return rates and service quality (Liu, 2021; Liu et al., 2020b).

Wieland (2023) suggested that shopping channel selection is primarily determined by consumers 'spatial, sociodemographic, and psychographic traits. Factors such as transaction costs, including travel time, delivery fees, and information search effort, significantly influence both store selection and overall spending. Despite the importance of retail geography, a notable gap remains in exploring spatial shopping behavior when consumers are presented with integrated online-offline options (Wieland 2021).

Based on the established theoretical framework and the need to examine the complex multistage pathways inherent in omnichannel environments, the following formal hypotheses were developed:

H_{0a}: There is no statistically significant association between demographic factors (age and gender) and the preferred spatial choice of purchasing location (online versus physical store) across the evaluated product segments (groceries, alcohol, drugstore, cosmetics, books, electronics, clothing, and footwear).

H_{1a}: There is a statistically significant association between demographic factors (age and gender) and the preferred spatial choice of purchasing location across the evaluated product segments.

The evolving technological landscape plays a critical role in these transitions. Alexander and Kent (2022) examined the impact of technology on in-store customer experiences, while Ariannezhad et al. (2021) focused on understanding multichannel customer behavior. Furthermore, Chang and Chen (2022) highlighted that Generations Y and Z follow distinct shopper journeys, requiring targeted demographic strategies. To critically examine these sequences (e.g., browsing online and purchasing in-store or examining in-store and purchasing online), a second set of hypotheses was formulated:

H_{0b}: There is no statistically significant association between demographic factors (age and gender) and the sequencing of the purchase decision-making process (specifically webrooming, showrooming, or multirooming pathways).

H_{1b}: There is a statistically significant association between demographic factors (age and gender) and the sequencing of the purchase decision-making process.

However, the difference in purchasing amount between the group of customers who joined online membership and used offline channels and another customer group that joined offline membership and used online channels was not statistically significant in Kang et al. (2019). Loupiac et al. (2019) revealed that direct online experience on a website creates beliefs about the physical stores of the same brand. These beliefs, in turn, influence consumer attitudes towards the store (Kao et al., 2021). Many luxury brands treat their online and offline experiences as distinct and separate entities. However, in the era of omnichannel retailing, luxury brands that seek to circumvent future marketplace challenges should strive to provide a cohesive shopping experience that integrates both online and in-store elements (Burnasheva, 2019). The omnichannel consumer journey exerts both direct and indirect effects on electronic satisfaction (eS). Notably, women and younger consumers reported higher levels of e-satisfaction (Moliner and Tortosa-Edo, 2024).

Zhang (2023) confirmed the impact of omnichannel integration on consumer purchasing decisions. This study analyses the effectiveness of integrated marketing strategies and seamless customer experiences. In addition, the study by Kang et al. (2019) provides empirical evidence of omnichannel purchasing patterns, influencing health and lifestyle products across different channels. Compared to consumers who choose home delivery, those who choose alternative options are more likely to engage in physical effort but are less interested in closely monitoring informational updates. The requirement for social interaction often discourages consumers from opting for attended deliveries, thereby making unattended options, such as home delivery and self-collection, more attractive. Additionally, factors such as socio-demographic characteristics and product value influence consumer preferences (Sun et al., 2020; Wang et al. 2024). Creating omnichannel strategies requires an understanding of how customers use multiple channels in a multichannel environment (Gasparin and Slongo, 2023).

The provision of free Wi-Fi network access in physical stores is another key element in facilitating channel integration, especially considering that mobile devices are currently redefining the in-store experience. In addition to providing an overview of omnichannel in this field, the research evaluates the association between age and gender.

3. Materials and Methods

Primary data were collected using a structured quantitative research design aimed at analyzing omnichannel purchasing behavior across online and offline retail environments. This study focused on consumers with prior experience in omnichannel shopping, allowing for the examination of purchasing pathways involving multiple touchpoints. Data were collected between 2024 and 2025, reflecting a contemporary retail context characterized by increasing digital-physical channel integration. Primary data were gathered using an electronic, self-administered questionnaire (CAWI method) hosted on the Google Form platform. The data collection phase was conducted between 2024 and 2025. To reach the target audience, the survey was distributed through targeted digital communication channels, including social media groups and university-

affiliated networks, focusing on individuals with active experience in online purchasing

A total of 889 valid and eligible responses were included in the final dataset of this study. The sample size provides a sufficient empirical basis for comparative analyses across demographic groups and product categories. Respondents were categorized into four age groups (18-23, 24-29, 30-36, and 37-42 years) and by gender (male and female), enabling the assessment of demographic heterogeneity in purchasing behaviors and channel allocation preferences. This demographic segment was selected because of its high engagement with digital technologies and e-commerce platforms. The demographic composition of the sample was informed by official census data from the Statistical Office of the Slovak Republic, ensuring that the age and gender distribution of respondents broadly reflects the structure of the target population.

The research instrument was developed based on a multidimensional framework of five key omnichannel identifiers derived from established marketing literature: 1) Channel Interconnectivity; 2) Content Consistency; 3) Process Continuity; 4) Individual Approach; and 5) Delivery/Payment Flexibility. The questionnaire consisted of 29 items, including nominal filter questions, ordinal preference scales, and specific behavioral scenarios (e.g., BOPAC adoption)

3.1. Research design and data analysis methods

While contemporary omnichannel research frequently employs variance-based structural equation modeling (PLS-SEM) to explore latent psychological variables (Ali et al., 2023), the specific objectives of this study necessitated a different statistical paradigm. PLS-SEM is optimal for continuous latent constructs; however, the primary variables analyzed here, specifically the discrete spatial choice of transaction location and demographic cohort membership, are nominal and categorical. Consequently, this study employed a rigorous non-parametric categorical data analysis framework.

The Pearson Chi-Square Test of Independence, coupled with standardized residual analysis, is mathematically optimal for identifying statistically significant structural associations across discrete demographic cohorts. These categorical methods effectively map the topological distribution of the purchasing pathways.

To enhance the analytical depth and address the predictive power of demographic variables, multinomial logistic regression (MLR) was employed. This method allowed for modeling the probability of specific consumer behaviors and purchase motivators based on age cohorts and channel interaction preferences of the consumers. The model's goodness-of-fit was evaluated using the Nagelkerke R^2 coefficient, and the significance of individual predictors was determined using Likelihood Ratio Tests. This advanced technique complements the non-parametric analysis by quantifying how structural demographic factors and digital touchpoint engagement influence the consumer's decision-making process.

This analytical perspective enables a more nuanced understanding of consumer behavior beyond single-channel preferences and aligns with contemporary research on omnichannel retailing. Table 2 summarizes the operationalization of the key constructs, demographic variables, and analytical dimensions. This design supports the identification of structured omnichannel purchasing pathways and facilitates systematic comparisons across demographic segments of consumers.

Table 2. Primary research design (Source: Authors)

Research problem: **Identification of consumer behavior (Generation Y and Z) in relation to key consumer journey identifiers through online and offline touchpoints.**	
Partial research goal: Omnichannel Adoption Across Generations	
Hypothesis	Primary research
H_{0a}: There is no statistically significant association between demographic factors (age and gender) and the preferred spatial choice of purchasing location (online versus physical store) across the evaluated product segments (groceries, alcohol, drugstore, cosmetics, books, electronics, clothing, and footwear). H_{1a}: There is a statistically significant association between demographic factors (age and gender) and the preferred spatial choice of purchasing location across the evaluated product segments.	Age group: 18-23;24-29;30-36;37-42. Gender: Male (M); Female (F)
Omnichannel decision pathway Captured through consumers' sequential interactions with online and offline touchpoints, identifying webrooming, showrooming, and consistent channel paths. H_{0b}: There is no statistically significant association between demographic factors (age and gender) and the sequencing of the purchase decision-making process (e.g., specific webrooming, showrooming, or multi-rooming pathways). H_{1b}: There is a statistically significant association between demographic factors (age and gender) and the sequencing of the purchase decision-making process.	**Purchasing spatial choice behavior**: Operationalized as consumers' preferred transaction channel (online vs. brick-and-mortar) across eight categories: 1) groceries; 2) alcohol; 3) drugstore; 4) cosmetics; 5) books; 6) electronics; 7) clothing; and 8) footwear.
Purchasing Pathways Definitions a) Webrooming (Online/BM): Browse online and complete the purchase in a brick-and-mortar store. b) Showrooming (BM/Online): Examine the product in a brick-and-mortar store and complete the purchase online. c) Pure Offline (BM/BM): Examine and complete the purchase entirely within a brick-and-mortar environment. d) Pure Online (Online / Online): Browse and complete the purchase entirely through online platforms ** While multirooming represents the broader behavioral context, our analysis strictly isolates specific measurable sequences, such as webrooming and showrooming, to meet the systemic requirements of retail engineering and inventory optimization*	

To complement significance testing, measures of association, such as Cramér's V and the contingency coefficient, were used to assess the strength of the observed relationships. The inclusion of effect size measures is particularly important in large-sample studies (N = 889), where statistical significance alone may not adequately capture the substantive relevance of observed associations.

4. Results and discussion

The empirical analysis provides a segmented examination of omnichannel purchasing behavior across multiple retail product categories, including cosmetics, books, electronics, clothing, footwear, groceries, alcohol, and drugstore items.

The drugstore category exhibited strong and consistent demographic differentiation across all age groups, with significant deviations in both male and female cohorts. In the cosmetics sector, notable correlations between age, gender, and channel preference were identified. Specifically, among respondents aged 18-23, males exhibited a propensity for showrooming behavior in the cosmetics category while showing a negative deviation for pure online purchasing (Appendix 2). The book segment demonstrated the highest degree of demographic differentiation, particularly within the 30-36 and 37-42 age groups, respectively.

Within the electronics segment, statistically significant associations were absent among the oldest cohort (37-42; p=.176), whereas younger age groups and the aggregate sample demonstrated significant associations (Total: p=.006, V=.119), albeit with a weak overall effect size indicating comparatively uniform channel allocation behavior relative to other product categories. In the alcohol segment, statistically significant associations were identified across all age groups, including the youngest cohort (18-23; p=.002) and the 30-36 group (p<.001), indicating consistent demographic differentiation in channel preferences for this product category.

Table 3. Categorical Analysis of Spatial Purchasing Behavior Across Product Segments (N=889) (Source: Authors)

Category / Age	Pearson χ^2	df	p-value	Cramér's V
Groceries				
18-23	1.510	1	.219	.095
24-29	14.035	2	.001	.263
30-36	7.603	2	.022	.167
37-42	33.472	2	<.001	.370
Total Groceries	**29.265**	**3**	**.002**	**.183**
Alcohol				
18-23	12.923	2	.002	.277
24-29	9.383	2	.009	.215
30-36	33.676	3	<.001	.351
37-42	30.158	3	<.001	.351
Total Alcohol	**10.061**	**3**	**.018**	**.106**
Drugstore				
18-23	23.289	3	<.001	.372
24-29	28.754	3	<.001	.376
30-36	28.274	3	<.001	.322
37-42	15.479	3	.001	.251
Total Drugstore	**68.186**	**3**	**<.001**	**.277**
Cosmetics				
18-23	17.622	3	<.001	.324
24-29	40.602	3	<.001	.447
30-36	16.476	3	<.001	.246
37-42	37.497	3	<.001	.391
Total Cosmetics	**36.037**	**3**	**<.001**	**.201**
Books				
18-23	1.816	3	.612	.104
24-29	11.978	3	.007	.243
30-36	83.590	3	<.001	.553
37-42	56.199	3	<.001	.479
Total Books	**57.488**	**3**	**<.001**	**.254**
Electronics				
18-23	22.456	3	<.001	.366
24-29	25.189	3	<.001	.352
30-36	48.534	3	<.001	.422
37-42	4.937	3	.176	.142
Total Electronics	**12.578**	**3**	**.006**	**.119**
Clothing				
18-23	44.605	2	<.001	.515
24-29	18.745	3	<.001	.304
30-36	34.688	3	<.001	.356
37-42	12.525	3	.006	.226
Total Clothing	**15.813**	**3**	**<.001**	**.130**
Footwear				
18-23	11.715	3	.008	.264
24-29	15.474	3	<.001	.276
30-36	13.096	3	.004	.219
37-42	23.619	3	<.001	.310
Total Footwear	**15.108**	**3**	**.002**	**.130**

**Note: "Constant" indicates sub-segments where observed responses exhibited zero variance, preventing the standard chi-square calculation.*

The degrees of freedom vary across age subgroups within categories due to structural zeros in the contingency tables, where certain purchasing pathways were absent for specific demographic cohorts. These sub-segments are excluded from the chi-square computation per the 'Constant' condition noted in Table 3.

At the aggregate level, both cosmetics and electronics showed statistically significant associations, although the effect sizes were weaker for electronics. However, segment-level analyses revealed moderate to strong effect sizes in specific age-product combinations, notably within the **book** segment for older cohorts, whereas the clothing segment showed uniform patterns across these groups.

These findings indicate that aggregate-level insignificance may conceal meaningful within-segment variations in purchasing behavior (see Table 3). While chi-square tests identify statistically significant associations between demographic variables and purchasing behavior, effect size measures provide additional insights into the substantive relevance of these relationships. Across product categories, the magnitude of the associations varied considerably by age group, indicating the heterogeneous strength of demographic effects.

The use of standardized residual analysis (Appendix 1 and 2) provides the necessary granularity to identify which specific demographic segments drive the aggregate significance observed in Table 3. This multi-level analytical approach ensures that operational decisions in retail engineering are based on specific behavioral deviations rather than generalized demographic assumptions.

Moderate to strong associations were observed in the book segment within the selected age cohorts, whereas the drugstore segment exhibited strong aggregate-level associations, with high effect sizes across all age groups. In contrast, the weaker effect sizes in electronics and clothing indicate comparatively uniform purchasing behavior across demographic groups, despite occasional statistical significance. These results demonstrate that statistical significance alone does not fully capture the structure of omnichannel purchasing behavior and that effect size patterns are essential for identifying economically meaningful demographic differences.

In the second stage of the analysis, purchase decision-making processes (Appendix 1 and 2; Tables 5 and 6) associated with webrooming and showrooming behaviors were examined to test hypotheses H_{0b} and H_{1b}. The results reveal distinct age and gender-based patterns in omnichannel decision pathways. Younger males (18-23) exhibited positive deviations toward showrooming behavior specifically in the alcohol and cosmetics segments, whereas females within the same cohort displayed more heterogeneous purchasing pathways. (Appendix 1 and 2). Among respondents aged 30-36, males demonstrated consistent statistically meaningful deviations favouring webrooming behavior in categories such as books and cosmetics, while females in this cohort showed significant negative deviations for the webrooming pathway (Appendix 2); conversely, males in this segment demonstrated a significant positive deviation toward the pure in-store purchasing pathway (BM/BM). In the oldest cohort (37-42), gender-specific decision-making patterns became more pronounced, with females exhibiting positive deviations toward webrooming and males toward brick-and-mortar purchases. The results further indicate that webrooming and showrooming behaviors are not symmetrically distributed across demographic groups. While both behaviors represent forms of omnichannel integration, their prevalence systematically differs by age and gender.

Webrooming behavior exhibits a greater demographic concentration, particularly among female respondents in younger and middle-aged cohorts. In contrast, showrooming behavior appears to be more prevalent among younger male consumers, suggesting distinct information acquisition and risk mitigation strategies. This asymmetry indicates that omnichannel integration should not be treated as a homogeneous construct but as a set of differentiated behavioral pathways reflecting selective channel use.

This asymmetry partially contradicts the findings of Matos et al. (2022), who identified gender-based differences in channel interaction but did not observe a consistent dominance of webrooming among female consumers across product categories. A possible explanation lies in the product mix examined: the present study includes categories such as cosmetics and drugstore items, which are traditionally associated with higher female purchase involvement and where physical inspection retains experiential value. This product-demographic interaction may amplify webrooming tendencies among female consumers in ways that are not visible in studies using broader or less differentiated category sets.

Beyond individual product categories, the results indicate varying degrees of omnichannel purchasing intensity across different demographic groups**.** Certain age-gender combinations exhibit a higher concentration of integrated purchasing pathways, characterized by frequent transitions between online and physical touchpoints.

Older consumers (30-42) exhibit the highest concentration of significant omnichannel deviations, whereas younger cohorts show selective engagement across fewer channels. Older consumers tend to integrate these behaviors more selectively, focusing their omnichannel engagement within specific segments rather than across their entire purchasing portfolio. These patterns indicate that the intensity of omnichannel engagement is unevenly distributed across the population, reflecting differentiated purchasing strategies rather than universal adoption of a single strategy. The results revealed statistically significant associations between demographic characteristics and omnichannel purchasing behavior across selected product categories (notably groceries, alcohol, books, and footwear) and age groups, with additional significant associations observed in cosmetics, electronics, clothing, and drugstore categories (Table 3). These findings underscore the presence of structured demographic heterogeneity in both channel choice and omnichannel decision-making pathways.

4.1. Predictive analysis of purchase motivators

The multinomial logistic regression (MLR) analysis revealed that age cohorts and channel integration factors significantly predict consumer purchasing motivators. The models demonstrated substantial explanatory power, with Nagelkerke R^2 values ranging from 0.501 to 0.513, indicating a strong association between demographic structures and behavioral outcomes (Table 4). These values are notably high relative to comparable behavioral studies in omnichannel retailing, where Nagelkerke R^2 coefficients typically range between 0.20 and 0.35, suggesting that the combination of demographic cohort membership and channel integration preferences captures a substantial proportion of the variance in consumer purchase motivators.

Specifically, the model for 'Influence of friends' achieved the highest predictive accuracy (Nagelkerke R^2 =0.513), where the age cohort emerged as a critical significant predictor ($p<0.001$). Regression coefficients indicate that as consumers

move into older cohorts (24-36 years), they rely significantly less on peer consultation compared to the youngest group (18-23 years), exhibiting a shift toward autonomous decision-making (Table 4).

Table 4. Multinomial Logistic Regression Analysis of Purchase Motivators (Source: Authors)

Dependent Variable: Motivator	R^2	Sig. Predictors	Pearson (χ^2)	df	p-value
Influence of friends	0.513	Age cohort	39.740	12	<.001
		Online content tracking	12.490	4	.014
		Social media to e-shop links	17.704	4	.001
		Discount code search	9.936	4	.042
Product aesthetics	0.501	Age cohort	32.411	12	<.001
		Social media to e-shop links	11.558	4	.021
		Discount code search	18.230	4	.001
Influence of influencers	0.508	Age cohort	28.920	12	.004
		Social media to e-shop links	13.035	4	.011

Furthermore, the likelihood of being motivated by 'Product aesthetics' (Nagelkerke $R^2 = 0.501$) is heavily influenced by the consumer's demand for seamless channel integration, specifically the presence of direct social media-to-e-shop links ($p=0.021$). These findings mathematically confirm that omnichannel purchasing pathways are not random choices but are structured by a combination of generational traits and technical channel capabilities (Table 4)

4.2. Discussion

This study provides empirical evidence that omnichannel purchasing behavior reflects structured decision-making pathways rather than simple substitutions between online and physical retail channels. These findings are consistent with prior research emphasizing that consumer behavior in omnichannel environments follows a multi-stage decision-making process rather than a binary channel choice (Pires et al., 2022; Rodríguez-Torrico et al., 2020a; Rodríguez-Torrico et al., 2020b). Our results extend this understanding by quantifying how specific demand signals such as the 'Social media to e-shop links' identified in the MLR model and illustrated in the decision sequences of Figure 1 function as critical predictors of these pathways.

This supports the interpretation of omnichannel purchasing as an allocation mechanism shaped by information costs, perceived risk, and channel accessibility. The predictive analysis (Table 4) and the residual patterns observed in Appendix 1 and 2 demonstrate that these allocation strategies are not uniform; for instance, the declining reliance on peer consultation among older cohorts (Generation Y) correlates with their preference for in-store transactions in routine segments like groceries. Consequently, the findings demonstrate that age and gender significantly shape how consumers distribute purchasing activities across channels, supporting the interpretation of omnichannel retailing as an economically organized system of complementary distribution mechanisms that dictate the operational requirements of modern retail engineering ecosystems.

The regression output further strengthens the observation that younger consumers (Generation Z) operate in a more socially and digitally integrated ecosystem. The high predictive value of 'Social media-to-e-shop links' in the MLR model correlates with the observed webrooming pathways, where digital information acquisition is the primary driver of transactions. In contrast, the declining reliance on external influences among older cohorts (Generation Y) aligns with their preference for in-store purchasing in routine segments such as groceries, where experiential validation outweighs digital persuasion. These results support the conceptualization of omnichannel retail not as a replacement for traditional methods but as a multi-stage allocation process driven by demographic-specific rationalities.

It is noteworthy, however, that despite their high digital engagement, Generation Z consumers did not exhibit statistically significant preferences for purely online transaction completion across most product categories. This finding nuances the prevailing narrative of a uniform digital-first generation and aligns more closely with Chang and Chen (2022), who demonstrated that Generation Z follows hybrid shopper journeys rather than exclusively digital ones. Being digitally fluent does not mean buying exclusively online. For Generation Z, physical stores still serve a clear purpose mainly for checking products before buying elsewhere.

The high predictive value of 'Social media to-e-shop links' ($p = 0.021$) suggests that digital touchpoints act as primary catalysts for non-linear demand signals. For production engineering systems, this implies that social media engagement data can serve as an early-stage proxy for warehousing and last-mile delivery requirements, bridging the gap between digital marketing and supply chain synchronization.

From an economic perspective, these findings reinforce the view that digital and physical channels perform complementary functions in the consumer decision-making process. Digital channels primarily reduce search and information costs, whereas physical retail environments provide experiential verification and risk mitigation. Prior studies confirm that consumers with a higher tendency toward omnichannel behavior process information differently and exhibit distinct response

patterns, indicating that omnichannel integration reflects rational decision-making under heterogeneous constraints rather than inconsistent consumer behavior (Tyrväinen & Karjaluoto, 2019).

The findings reveal that individuals aged 24-29 exhibit mixed purchasing patterns; with a tendency toward online completion in selected categories (e.g., electronics, cosmetics), but not uniformly across all product segments.This trend indicates that younger consumers perceive digital channels as offering lower transaction costs and greater convenience at the point of purchase. Conversely, individuals aged 30-42 demonstrate a sustained preference for brick-and-mortar stores in routine product categories such as groceries, reflecting the continued economic role of physical retail in experiential validation and risk mitigation. In the grocery segment, older consumers (37-42) showed a tendency toward brick-and-mortar purchasing, yet this preference did not reach statistical significance (residual $1.4 < 1.96$), indicating a balanced channel allocation rather than a clear dominance of either channel. This observation contrasts with previous studies that suggest a generalized shift towards online grocery shopping, highlighting the persistence of product- and context-specific channel allocation strategies.

Older consumers appear to stick with familiar purchasing habits visiting physical stores even when digital alternatives are available. This aligns with the concept of status quo bias, where switching to a new channel carries psychological costs that outweigh the perceived convenience.This interpretation extends the transaction cost framework applied by Wieland (2023), suggesting that for older cohorts, the perceived costs of digital adoption including uncertainty, effort, and loss of interpersonal interaction outweigh the convenience benefits that drive younger consumers toward online completion. Retailers targeting this segment should therefore prioritize seamless in-store experiences rather than aggressive digital migration strategies.

Gender-based differences further contribute to the heterogeneity of omnichannel decision-making. The role of perceived value further elucidates this diversity. Empirical evidence suggests that the effectiveness of channel integration depends on consumers' ability to transition seamlessly across touchpoints and perceive consistency across channels (Rakhmanita et al., 2023). Consistent with the literature, the results of the present study indicate that omnichannel purchasing pathways differ systematically across demographic groups, reflecting variations in perceived benefits, decision costs, and channel familiarity rather than uniform adoption patterns.

Webrooming behavior appears in selected categories among younger female consumers, particularly cosmetics, but is not uniformly dominant across all product segments. Males in the 30-36 age group exhibit a greater tendency toward webrooming or in-store-oriented purchasing strategies. These patterns suggest that omnichannel pathways are shaped not only by access to digital technologies but also by demographic differences in information processing, risk perception, and purchasing habits.

The results show that a simple online-offline distinction is insufficient to capture how consumers actually behave in omnichannel environments.

Instead, purchasing decisions emerge from structured pathways in which digital and physical channels perform complementary roles, depending on demographic characteristics and product categories. This highlights the importance of channel complementarity rather than channel substitution in understanding contemporary consumer behavior within a multistage economic framework.

From an economic standpoint, the observed purchasing pathways indicate that consumers actively balance efficiency and risk when navigating omnichannel retail environments to maximize their utility. Younger consumers' preference for digitally completed transactions suggests lower perceived transaction costs and higher confidence in online purchasing mechanisms, even when physical stores are used for preliminary information gatherings. This behavior is consistent with economic models of rational choice under reduced uncertainty and increased digital literacy.

In contrast, the increased reliance on traditional brick-and-mortar purchasing among older consumers in specific product categories can be attributed to the greater perceived benefits of physical inspection and interpersonal interactions. These findings support the interpretation that channel choice is influenced by diverse cost-benefit structures rather than the uniform adoption of technology. Therefore, omnichannel retail systems should be conceptualized as environments in which different channels specialize in distinct economic functions.

The presence of webrooming and showrooming behaviors further illustrates the complementary relationship between online and offline channels. Previous research has also highlighted the importance of digital communication and marketing channels in shaping early stage purchasing decisions. Digital tools influence consumer expectations and information acquisition, particularly at the beginning of the decision-making process, even when the final transactions are completed offline (Ravindran and Sathyamoorthi, 2019; Ulker-Demirel, 2019). This aligns with the empirical evidence of this study, which shows that online channels frequently dominate the information search phase of omnichannel purchasing pathways. Rather than signaling inefficiencies or consumer confusion, these behaviors represent economically rational strategies that allow consumers to optimize information acquisition and transaction execution across all channels. Such strategies reduce overall decision-making costs while preserving the flexibility of the purchasing process.

These results add to existing evidence that online and offline channels work alongside each other rather than competing for the same customers. From a retail economics perspective, this implies that investments in digital infrastructure do not diminish the value of physical retail assets but may enhance their strategic role within integrated distribution systems.

Compared to existing research, this study contributes to omnichannel literature by integrating purchasing locations and decision-making pathways within a unified analytical framework. By focusing on consumers rather than customers, the analysis acknowledges that purchasing decisions may involve

transactions made for others or across multiple usage contexts, offering a broader interpretation of demand allocation in omnichannel retail.

This study has several limitations. The exclusion of income-related variables reflects respondents' reluctance to disclose financial information, which may limit direct comparability with markets characterized by higher-income transparency. Nevertheless, prior evidence indicates that Slovak consumers exhibit high sensitivity, suggesting that the observed purchasing patterns remain informative for understanding omnichannel decision-making, which is driven primarily by value considerations rather than income segmentation.

Figure 1 provides a synthesized representation of omnichannel purchasing pathways across age groups and product categories, supporting the empirical interpretation of omnichannel behavior as a structured-allocative process. Although consumers aged 24-29 frequently engage with online channels during the information search phase, their preference for completing transactions purely online was not statistically significant across most product categories, suggesting a more complex and selective pattern of channel integration than a simple digital-first strategy.

In contrast, older consumers exhibit a stronger reliance on in-store purchasing pathways in selected categories, notably groceries, reinforcing the continued economic role of brick-and-mortar retail environments in omnichannel systems. Gender-based differences are also apparent, with webrooming behavior being more prevalent among female consumers in younger cohorts, while males in middle age groups (30-42) exhibited significant negative deviations for showrooming pathways in categories such as groceries and alcohol.

Overall, Figure 1 visually reinforces the interpretation that omnichannel integration does not imply the replacement of physical retail with digital channels. Instead, online and offline touchpoints operate as complementary elements within consumer decision-making pathways, consistent with the study's broader economic framing of omnichannel retailing behavior.

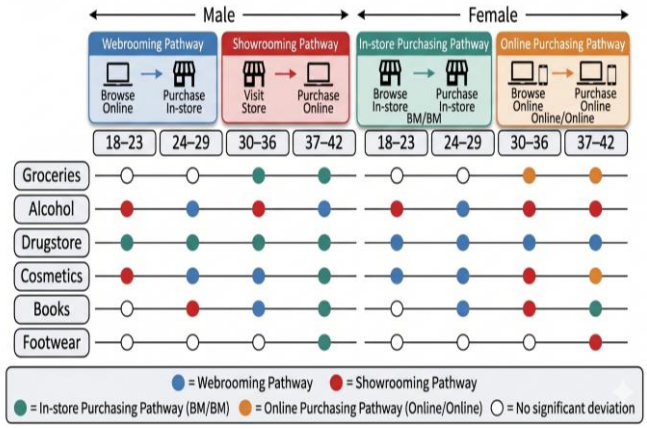

Fig. 1. Omnichannel Purchasing Pathways across Age Groups and Product Categories, incorporating social media to e-shop links as critical path drivers. (Source: Authors)

These findings are particularly relevant for retail systems that operate under cost pressures and channel coordination constraints. The figure presents the dominant purchasing pathways (webrooming, showrooming, in-store-, and online purchasing) identified through a standardized residual analysis. Product categories are displayed on the vertical axis, while age groups (18-23, 24-29, 30-36, 37-42) separated by gender are shown on the horizontal axis. Colored markers indicate statistically significant deviations from the expected frequencies, illustrating demographic heterogeneity in channel selection and pathway structure within omnichannel purchasing behavior.

These findings partially corroborate and extend the work of Moliner and Tortosa-Edo (2024), who demonstrated that women and younger consumers report higher levels of e-satisfaction throughout the omnichannel consumer journey. Whereas their multi-rooming framework captures the broad, fluid oscillation between touchpoints, the present study provides granular empirical evidence that this oscillation is not random but is structured into distinct, demographically differentiated pathway sequences (webrooming and showrooming), with specific behavioral asymmetries by age and gender. This distinction advances the theoretical understanding of multi-rooming by decomposing it into operationally measurable sub-pathways relevant for retail engineering and inventory management.

5. Summary and conclusion

This study establishes that omnichannel purchasing is a structured economic decision-making process rather than a random or binary choice between digital and physical channels. By analyzing data from 889 consumers, the research demonstrates that these "purchasing pathways" are systematically dictated by demographic factors, particularly age and gender.

Primary and secondary research frame omnichannel behavior as an allocation mechanism where consumers distribute activities such as information search, evaluation, and transaction to optimize information acquisition and reduce uncertainty.

Younger consumers (Generation Z) engage extensively with digital touchpoints yet demonstrate selective rather than exclusive online purchasing, consistent with hybrid channel strategies identified in the MLR analysis.

Older consumers (Generation Y) rely more consistently on physical retail for necessity-based categories, reflecting higher psychological switching costs and the experiential value of in-store interaction.

The study identifies that webrooming (browsing online and buying in-store) and showrooming (examining in-store and buying online) are not symmetrically distributed; webrooming is more pronounced among female consumers in younger and middle-aged cohorts. Showrooming is more prevalent among younger male consumers, suggesting distinct strategies for information acquisition and risk management.

Among the oldest cohort (37-42), gender patterns become even more distinct, with females favoring webrooming and males favoring brick-and-mortar transactions

Multinomial logistic regression (MLR) confirms that these pathways are structured by generational traits and technical channel capabilities.

The model for the "Influence of friends" showed the highest predictive accuracy (R^2=0.513), revealing that as consumers age, they rely significantly less on peer consultation.

The motivation of "Product aesthetics" (R^2=0.501) was heavily influenced by the presence of direct links between social media and e-shops, highlighting how seamless integration drives the purchasing journeys of younger digitally integrated cohorts.

For production and supply chain managers, these behavioral differences are not just a marketing concern they directly affect how inventory should be planned and allocated. They generate nonlinear demand signals that dictate how physical inventory must be allocated across distribution centers versus storefronts to prevent stockouts and minimize holding costs. By conceptualizing omnichannel behavior as a structured allocation process, this study provides the necessary "architectural insight" to optimize modern retail supply chains and fulfill systemic requirements for operational resilience.

From a practical standpoint, the demographic-specific purchasing pathways identified in this study carry direct implications for retail operations and inventory management. Retailers serving female consumers in the 24-29 and 30-36 age cohorts in categories such as cosmetics and drugstore items should anticipate elevated webrooming demand, meaning that physical store inventory must be maintained at levels sufficient to capture transactions initiated through digital channels. Conversely, the showrooming tendency observed among younger male consumers (18-23) in categories such as electronics and alcohol suggests that online fulfilment capacity and competitive pricing transparency are critical conversion factors for this segment. Furthermore, the predictive significance of social media-to-e-shop links identified in the MLR analysis suggests that social media engagement metrics can serve as leading indicators of short-term demand shifts, enabling more responsive inventory allocation and last-mile delivery planning. For production engineering systems operating under cost and capacity constraints, these findings imply that demographic segmentation should be integrated not only into marketing strategy but also into demand forecasting models and distribution network design. Building the same omnichannel system for all consumer segments is unlikely to work well, given how differently age and gender groups behave across product categories.

Overall, this study shows that omnichannel behavior cannot be adequately captured using a binary online-offline framework. The results of this study provide further empirical support for conceptualizing omnichannel purchasing as a structured and economically rational decision-making process. The observed purchasing pathways are consistent with prior findings, indicating that consumers strategically integrate online and offline channels to optimize information acquisition, reduce uncertainty, and enhance perceived value throughout the purchasing process (Pires et al., 2022; Rodríguez-Torrico et al., 2020b). Omnichannel behavior, rather than indicating a substitution of channels, represents a complementary distribution of decision-making activities across retail channels. Purchasing decisions emerge from dynamic, demographic-specific pathways, where online and physical channels function as complementary components within the retail system. Treating omnichannel purchasing as a demand allocation problem rather than simply a channel choice opens up more useful ways to study and design retail systems.

5.1. Limitations and future research

This study has several limitations. Although the sample size of 889 respondents provides a solid empirical basis for categorical analysis, future research could extend the geographical scope of this study to enhance its generalizability. Additionally, the exclusion of income-related variables limits the ability to assess purchasing behavior from a detailed socioeconomic perspective. Nevertheless, prior evidence indicates that Slovak consumers exhibit high price sensitivity, suggesting that the observed purchasing patterns remain informative for understanding value-driven omnichannel decision making.

Another limitation of this study relates to its cross-sectional design, which captures purchasing behavior at a single point in time. Omnichannel retail environments have evolved rapidly in response to technological innovations, platform development, and changing consumer expectations. Consequently, longitudinal data can provide deeper insights into how purchasing pathways adapt over time and in response to market-level changes. These findings also align with previous evidence suggesting that omnichannel consumers are not a homogeneous group and that variations in channel usage reflect differentiated strategies rather than inconsistent behavior (Viejo-Fernández 2021).

By confirming that demographic characteristics systematically shape omnichannel purchasing pathways, this study extends the existing literature and contributes to a more nuanced understanding of omnichannel retailing as an allocation process embedded within contemporary digital economies (Madudova and Corejova, 2023; Rakhmanita et al., 2023). Furthermore, reliance on self-reported survey data may introduce recall bias or subjective interpretation of purchasing behavior. Future research could complement survey-based approaches with behavioral or transactional data to enhance the measurement accuracy and further validate the observed patterns.

A further limitation concerns the sampling procedure. As data were collected through social media groups and university-affiliated networks, the sample may systematically overrepresent younger, digitally proficient consumers. This recruitment strategy, while effective for reaching the target demographic of Generations Y and Z, may limit the generalizability of the findings to older consumer segments or populations with lower levels of digital engagement. Future research should consider probability-based sampling methods or complementary data sources to mitigate this potential bias.

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Appendix 1

Table 5. Standardized Residual Analysis of Purchasing Pathways by Segment, Age, and Gender (Source: Authors)

Category / Age	Gender	Online/ Online	Online / BM **	BM / Online ***	BM / BM
Groceries					
18-23	Male	—	0.8	—	-0.3
	Female	—	-0.8	—	0.3
24-29	Male	—	-1.8	-1.8	0.7
	Female	—	-1.8	-1.8	0.7
30-36	Male	-1.9	-0.1	—	0.3
	Female	1.9	0.1	—	-0.3
37-42	Male	-2.7	—	-2.7	1.4
	Female	2.8	—	2.8	-1.4
Total	Male	-3.3	1.3	-1.2	0.4
	Female	3.4	-1.4	1.2	-0.4
Alcohol					
18-23	Male	-0.2	—	2.3	0.7
	Female	2.0	—	-2.5	0.7
24-29	Male	1.0	1.8	-0.7	—
	Female	-1.0	-1.8	0.7	—
30-36	Male	1.8	-1.1	-3.3	1.0
	Female	-1.8	1.2	3.4	-1.1
37-42	Male	-0.1	1.8	-3.3	0.8
	Female	0.1	-1.8	3.4	-0.8
Total	Male	0.5	0.5	-2.1	0.3
	Female	-0.5	-0.5	2.1	-0.4
Drugstore					
18-23	Male	-0.2	-2.1	-1.9	1.6
	Female	0.2	2.3	2.1	-1.7
24-29	Male	-0.1	-3.2	-0.1	2.0
	Female	0.1	3.3	0.1	-2.0
30-36	Male	-3.3	-0.9	-0.1	1.5
	Female	3.4	1.0	0.1	-1.5
37-42	Male	-1.9	-1.2	-1.2	1.1
	Female	2.0	1.2	1.2	-1.1
Total	Male	-2.8	-3.8	-1.4	3.0
	Female	2.9	3.9	1.4	-3.1

**Note: BM = Brick-and-Mortar retail environment. Standardized residuals exceeding ±1.96 (indicate statistically significant deviations from the expected frequencies at the α=0.05 level.*

** Webrooming

*** Showrooming

Appendix 2

Table 6. Standardized Residual Analysis of Purchasing Pathways (Continued) (Source: Authors)

Category / Age	Gender	Online/ Online	Online / BM **	BM / Online ***	BM / BM
Cosmetics					
18-23	Male	-1.3	-1.3	2.1	-0.5
	Female	1.4	1.4	-2.3	0.5
24-29	Male	1.0	-3.6	-0.2	2.3
	Female	-1.0	3.8	0.2	-2.4
30-36	Male	-0.8	2.4	-1.3	0.3
	Female	0.8	-2.4	1.4	-0.3
37-42	Male	-2.8	-1.6	0.6	2.8
	Female	2.8	1.7	-0.6	-2.8
Total	Male	-2.3	-2.3	0.6	2.5
	Female	2.4	2.4	-0.6	-2.6
Books					
18-23	Male	0.0	-0.4	-0.3	0.8
	Female	0.0	0.4	0.3	-0.8
24-29	Male	0.3	-2.0	1.3	-0.2
	Female	-0.3	2.0	-1.4	0.2
30-36	Male	-3.3	4.4	-0.7	3.1
	Female	3.4	-4.5	0.7	-3.2
37-42	Male	-3.0	-1.2	-0.8	4.1
	Female	3.0	1.2	0.8	-4.2
Total	Male	-3.1	0.9	-0.4	4.1
	Female	3.2	-1.0	0.4	-4.3
Electronic					
18-23	Male	1.6	1.1	-1.6	-1.9
	Female	-1.8	-1.2	1.8	2.1
24-29	Male	1.0	-2.3	2.3	-0.9
	Female	-1.0	2.3	-2.4	0.9
30-36	Male	-4.1	1.2	2.4	-0.1
	Female	4.2	-1.2	-2.5	0.1
37-42	Male	-1.2	1.0	-0.1	-0.2
	Female	1.2	-1.0	0.1	0.2
Total	Male	-1.4	0.6	1.6	-1.1
	Female	1.4	-0.6	-1.7	1.1

**Note: BM = Brick-and-Mortar. Standardized residuals exceeding ±1.96 indicate statistically significant deviations at α=0.05.*
** Webrooming
*** Showrooming